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Module Introduction

Overview

This module describes the hard disks in the Apple Hard Disk SC series and presents procedures for setting up an external Hard Disk SC with an Apple II computer. During the Lab part of this course, you will learn how to take apart and troubleshoot a Hard Disk SC.

What You Will Learn

By the end of this module, you should be able to:

- Identify the basic capabilities of Apple SCSI Hard Disks
- Set up an Apple Hard Disk SC with an Apple IIGS computer

The Skills Checklist following this Module Introduction lists, in detail, the tasks you should be able to perform upon completion of this module.

How You Will Be Tested

The Module Test - This written test will help you verify that you have achieved the tasks outlined in the Skills Checklist.

The Prerequisite Exam - Consisting of hands-on and written items, this test will verify that you have mastered the skills listed above and are ready for the Lab part of this course.

Throughout all of the tests and exercises, you will be able to refer to these instructional materials and to other Apple reference materials.

Prerequisites to this Module

Before beginning this module, you must have satisfactorily completed these modules:

- Welcome to Apple Service
- Apple II Basic Features
- Setting Up Apple II Computers
- Using Apple II Computers
- Understanding SCSI
- Understanding ESD

Module Introduction

Materials Needed for this Module

The Prerequisite provides the following items for this module:

- This Module Workbook
- Module Test

Materials You Need to Provide

You need to provide the following:

- an Apple IIGS system, set up with mouse, keyboard, disk drive, and monitor
- an external Apple SCSI hard disk (HD20 SC, HD40 SC, HD80 SC or HD160 SC)
- an Apple II SCSI Card and cable
- a Hard Disk SC power cable
- a SCSI System Cable and Cable Terminator
- a current *Apple IIGS System Disk* (ver. 5.02 or later)
- a current *Apple IIGS System Tools* disk

If you have an Apple Hard Disk SC Owner's Manual, you might want to refer to it throughout the hands-on exercises in this module.

How the Module Is Organized

This module is presented in two parts.

Part 1 - Basic Features - This part describes the hard disks offered in the Apple Hard Disk SC series, explains the differences and similarities between the external and internal hard disks, and explains which hard disks are compatible with the various Apple II computers.

Part 2 - Setting Up an Apple Hard Disk SC - This part will guide you through the procedure for setting up an Apple HD SC with an Apple IIGS.

Following these two parts is a Module Summary.

Conitune with the Skills Checklist on the following pages.

Skills Checklist

What Is the Skills Checklist?

This is a list of tasks that you should be able to perform at the conclusion of the Apple Hard Disk SC module. The Prerequisite Exam (written and hands-on) will cover these items. During the Lab part of this course, you will be expected to be able to perform all of these tasks.

How to Use the Checklist

Before starting the module, check the items on this list to see which tasks you can already perform. If you are confident that you can already perform certain tasks, you may decide to skip those parts of the module. Or you may decide to try the Module Test without going through the module.

After completing the module, check this list to make certain that you have mastered all of the skills before you attend the Prerequisite Exam and the Lab part of this course. If you feel uncertain about any of these tasks, return to the section indicated, review the information, and repeat the hands-on exercises.

Skills Checklist

		Task	**Section Where the Task Is Covered**
____	1.	Identify the hard disks currently available from Apple and state their storage capacities.	Apple Hard Disk Capabilities
____	2.	Indicate which hard disks are compatible with specific Apple computers.	Apple Hard Disk Capabilities
____	3.	Explain two significant differences between internal hard disks and external hard disks (as shipped from the factory).	Apple Hard Disk Capabilities
____	4.	Properly position an Apple hard disk in relation to an Apple II computer.	Setting Up an Apple External Hard Disk with an Apple II
	5.	Install an Apple II SCSI Card in an Apple II computer.	Setting Up an Apple External Hard Disk with an Apple II
____	6.	Connect an external Apple Hard Disk SC to an Apple II computer.	Setting Up an Apple External Hard Disk with an Apple II
____	7.	Initialize an external Apple Hard Disk SC with an Apple II computer.	Setting Up an Apple External Hard Disk with an Apple II
____	8.	Make an external Apple Hard Disk SC a startup disk for an Apple II computer.	Setting Up an Apple External Hard Disk with an Apple II
____	9.	Follow the recommended procedures for turning on and turning off an Apple II system with an external hard disk.	Setting Up an Apple External Hard Disk with an Apple II

Skills Checklist

	Task	**Section Where the Task Is Covered**
____	10. State reasons for partitioning a hard disk.	Setting Up an Apple External Hard Disk with an Apple II
____	11. Describe the procedure for partitioning a hard disk.	Setting Up an Apple External Hard Disk with an Apple II
____	12. Indentify what the hard disk LED indicates.	Setting Up an Apple External Hard Disk with an Apple II
____	13. Explain why a hard disk formatted with a Macintosh should be reformatted before being used with an Apple II (or vice versa).	Setting Up an Apple External Hard Disk with an Apple II
____	14. Explain how to connect more than one external hard disk to a system.	Setting Up an Apple External Hard Disk with an Apple II
____	15. Explain the difference between erasing and zeroing a hard disk.	Setting Up an Apple External Hard Disk with an Apple II

Continue with the next section - Apple Hard Disk Capabilities.

Apple Hard Disk Capabilities

Overview

This section explains the advantages of hard disks and describes the hard disks currently offered by Apple.

Hard Disk Drives

A hard disk drive is a device used to store large amounts of data. Hard disk drives record data in the same manner as a 3.5-inch floppy disk drive, but instead of recording the data on a flexible plastic diskette, hard disk drives record the data on a stack of rigid metal disks encased in the drive. Figure 1 illustrates a stack of hard disks.

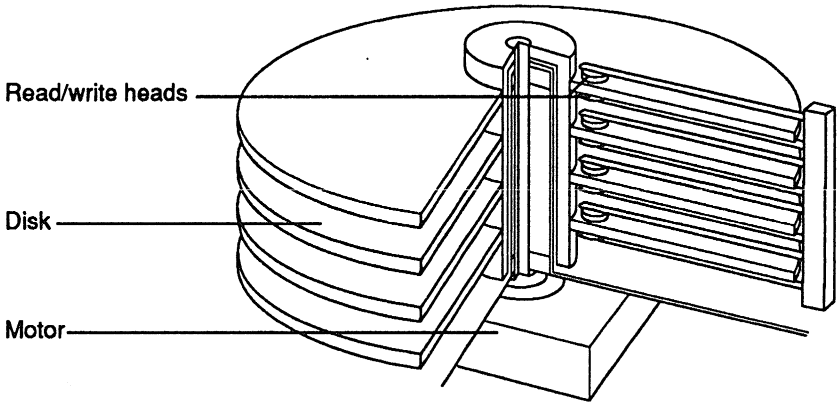


Figure 1. A stack of rigid disks

Advantages of Hard Disks

Hard disks have at least two advantages over floppy disk:

- Hard disks can store many times more data than floppy disks. Apple hard disks come in various capacities ranging up to 160 MB, compared to 800K that a floppy disk can store. (See Figure 2.)

Apple Hard Disk Capabilities

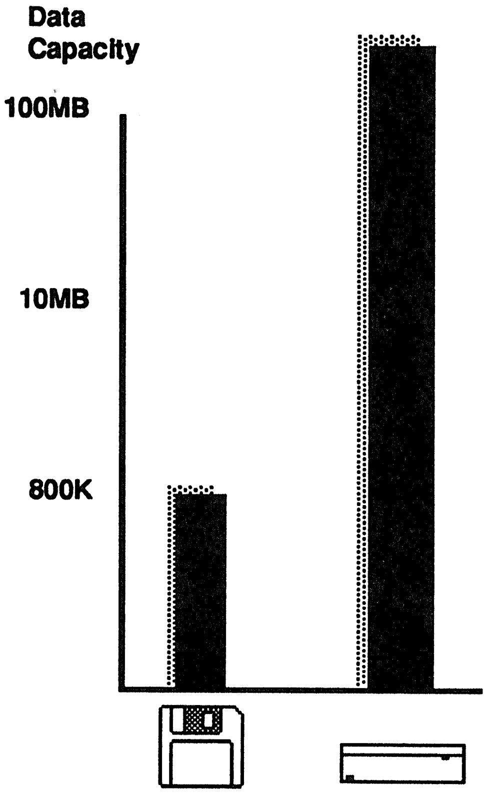


Figure 2. Comparison of storage capacity of an 800K floppy disk and a hard disk

- Hard disk drives spin at much faster speeds, so data can be written to and read from them much more quickly than with floppy disk drives. Figure 3 illustrates the comparison.

Apple Hard Disk Capabilities

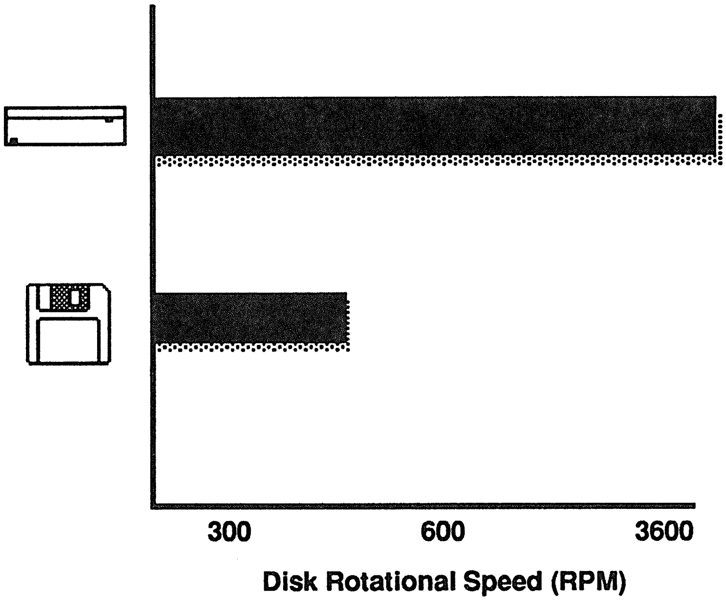


Figure 3. Comparison of disk rotation speed of an 800K floppy disk drive and a hard disk

Hard Disks as Storage Devices

Users can store all of their applications, documents, and important files on the hard disk. Users can then launch applications directly from the hard disk. This is more convenient for users because they do not have to insert and keep track of multiple application diskettes.

Hard Disks as Startup Devices

Most users configure one hard disk as a startup device. This means that the hard disk contains the system software that the computer requires to start up. The main advantage to configuring a hard disk as a startup device is that starting up (booting) from a SCSI device is faster than booting from a diskette. Also, since the users can store all their application programs on the hard disk, they can boot the computer, launch their application programs, and store their documents without using any diskettes.

Apple Hard Disk Capabilities

Apple Hard Disk SC Series

The Apple Hard Disk SC series of hard disks can be used with any Apple computer equipped with a Small Computer System Interface. The Hard Disk SCs range in storage size from 20MB to 160MB, as indicated by the product names:

- Apple Hard Disk 20SC
- Apple Hard Disk 40SC
- Apple Hard Disk 80SC
- Apple Hard Disk 160SC

The replaceable module that contains the actual rigid disks that data is stored on is called a Hard Disk Assembly (HDA). Generally, HDAs come in two sizes—3.5-inch and 5.25-inch. Apple II computers can use either size of HDA because the hard disks are connected externally to the computers.

External Hard Disk SCs

When configured for external use, the HDA is enclosed in a case with a power supply and fan, as shown in Figure 4.

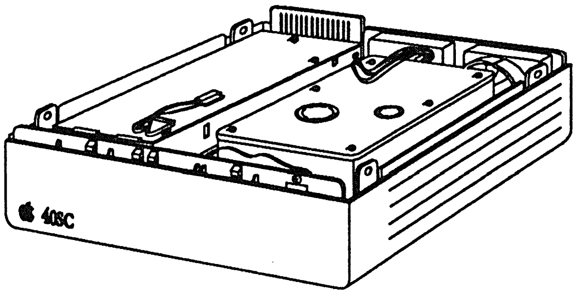


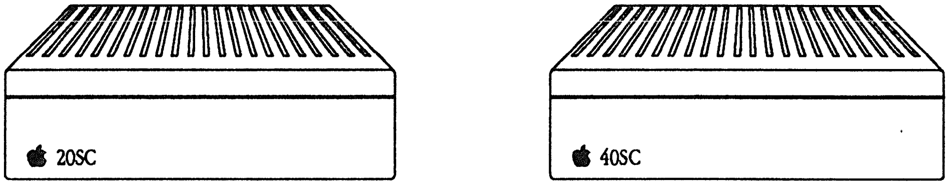
Figure 4. Inside view of an external Hard Disk SC

Apple Hard Disk Capabilities

All of the Hard Disk SCs can be connected externally to Apple IIe and Apple IIGS computers, that are equipped with an Apple II SCSI Card. The Apple II SCSI Card is connected to the Apple IIe or Apple IIGS through one of their expansion slots. Because they contain no expansion slots, Apple IIc Plus computers cannot use SCSI hard disks.

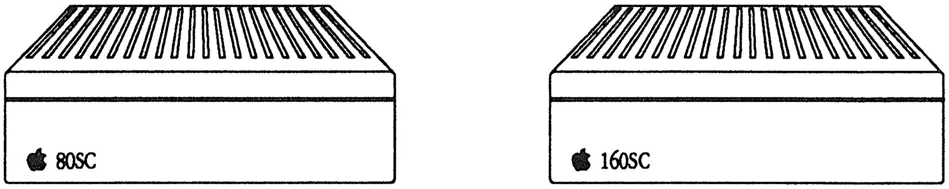
When Hard Disk SCs are larger than 32MB, users have to "partition" the hard disks to take full advantage of the storage space. Directions for partitioning a Hard Disk SC are provided later in this module.

When shipped in their external configurations, the Hard Disk SCs look alike except for their labels, as shown in Figure 5.



Apple HD 20SC

Apple HD 40SC



Apple HD 80SC

Apple HD 160SC

Figure 5. The Apple Hard Disk SC series

The connectors and switches on the back panel of the external hard disks are also alike, as shown in Figure 6.

Apple Hard Disk Capabilities

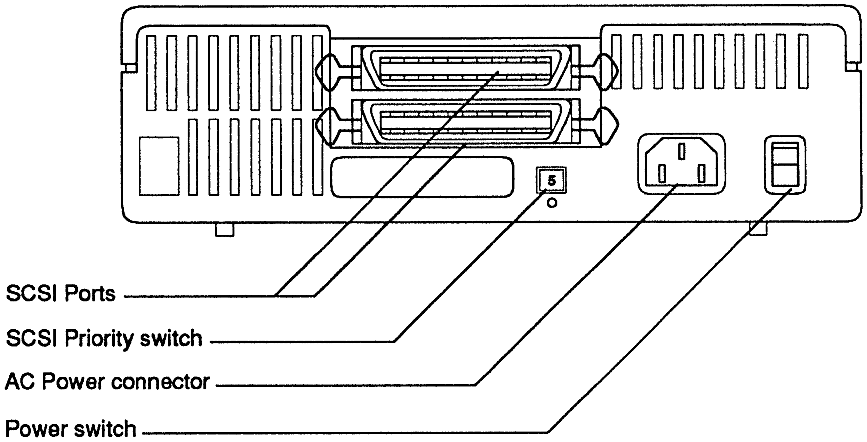


Figure 6. Back panel on a Hard Disk SC

Internal Hard Disk SCs

Some Macintosh computers can contain internal hard disks, as shown in Figure 7, but Apple II computers cannot contain internal hard disks.

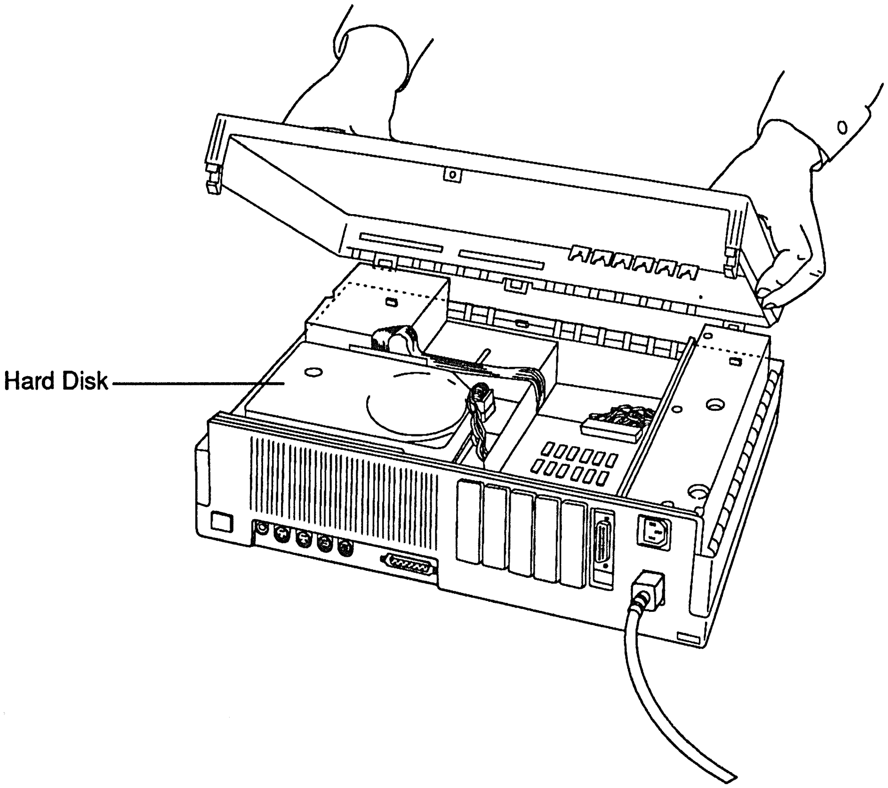


Figure 7. Internal Hard Disk SC installed inside a Macintosh II

Apple Hard Disk Capabilities

Converting Internal for External Use

As an Apple Service Technician, you will occasionally need to order a replacement HDA. Apple ships most HDAs in their internal configuration, which means that you may have to reconfigure an internal hard disk for external use.

As shipped from the factory, internal and external Hard Disk SCs differ in two significant ways:

1) Apple internal hard disk assemblies have built-in terminators (resistor packs), Apple external hard disk assemblies do not.

2) On Apple internal hard disk assemblies, the SCSI priority number is factory set at 0. On Apple external hard disk assemblies, it is set at 5.

To reconfigure an internal hard disk assembly for external use, you need to put the HDA in a plastic case, and you will probably need to change the SCSI priority number. You may also need to remove the built-in terminators.

Previous Models

Apple used to offer a non-SCSI hard disk drive for the Apple IIe and Apple ///. The ProFile 5 and 10MB hard disks were originally designed for use with the Apple ///, but can be used with the Apple IIe, Apple IIGS and LISA computers. ProFile hard disks have parallel interfaces and are not SCSI devices. Although Apple no longer sells this hard disk, your customers may have one of them and ask you to service it. So that you can recognize this model, Figure 8 shows one of the Profile hard disks.

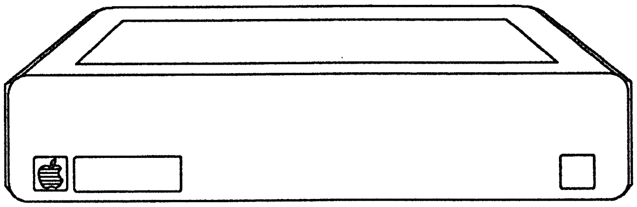


Figure 8. A ProFile hard disk

Continue with the next section – Exercise: Apple Hard Disk Capabilities.

Exercise: Apple Hard Disk Capabilities

Answer the following items as directed.

1. What are two advantages to using hard disks instead of floppy disks? Write your answers in the spaces provided.

   1) ____

   2) ____

2. Which external Hard Disk SCs can each of the following computers use? Indicate your answers by checking the spaces provided.

	HD20SC	HD40SC	HD80SC	HD160SC
Apple IIc	____	____	____	____
Apple IIe	____	____	____	____
Apple IIGS	____	____	____	____

3. Which Apple II computers can support internal hard disks? Check all correct answers.

   ___ A. Apple IIc
   ___ B. Apple IIe
   ___ C. Apple IIGS

4. Which of the Hard Disk SCs come from the factory with internal SCSI terminators? Check the correct answer.

   ___ A. internal Hard Disk SCs
   ___ B. external Hard Disk SCs
   ___ C. both internal and external Hard Disks SCs

Exercise: Apple Hard Disk Capabilities

5. What is the factory-set SCSI priority number for:

   a) internal Apple hard disks? _____

   b) external Apple hard disks? _____

Exercise: Apple Hard Disk Capabilities

Compare your answers to those on the following page.

Exercise: Apple Hard Disks Capabilities (Answers)

Compare your answers to those below.

1. 1) Hard disks can store more data
   2) Hard disks drives process data faster

2.

	HD20SC	HD40SC	HD80SC	HD160SC
Apple IIc				
Apple IIe	X	X	X	X
Apple IIGS	X	X	X	X

3. You should not have checked any of the computers listed. Apple II computers cannot contain internal hard disks.

4. A

5. Internal Apple hard disks – zero
   External Apple hard disks – five

If you missed one or more of the items of this exercise, review the section "Apple Hard Disk Capabilities".

Otherwise...

Continue with the next section – Setting Up an Apple External Hard Disk with an Apple II.

Setting Up an Apple External Hard Disk with an Apple II

Overview

In this exercise, you will set up an external Apple SCSI Hard Disk with an Apple IIGS computer. You will:

- Install an Apple II SCSI card in the Apple IIGS computer.
- Connect a SCSI hard disk to the computer.
- Install the SCSI Hard Disk update file to the startup disk.
- Initialize the SCSI hard disk.
- (optional) Partition a SCSI hard disk and initialize the partitions.
- Create a hard disk startup disk.

The section concludes with information about three additional tasks that you may have to perform for customers:

- connecting additional SCSI hard disks
- erasing a hard disk
- zeroing a hard disk

What You Will Need

To do this exercise, you will need the following:

- Apple IIGS computer system with monitor, disk drive, mouse, and keyboard
- an Apple SCSI hard disk of any capacity
- Apple II SCSI Card
- Apple SCSI System Cable
- Apple SCSI Cable Terminator
- Apple IIGS System disk (version 5.0 or greater)
- Apple IIGS System Tools disk (version 5.0 or greater)
- Hard disk power cable

Handle With Care

Hard disks are mechanical devices with moving parts. You must handle them with care. Whether the hard disk is operating or not, rough handling—such as dropping, jarring, or bumping—can cause the read-write heads to contact the disk, damaging the data and the disk surface. This is known as a "head crash." Careless handling accounts for more hard disk drive failures than all other factors combined.

Here are some guidelines for handling hard disks:

- Leave hard disk drives in their shipping containers until you need them.

- Place the hard disk drive on a soft, grounded surface before beginning any repairs.

Setting Up an Apple External Hard Disk with an Apple II

- Use the original shipping containers and packing materials when transporting hard disk drives.
- Never move the drive while its running or during power-down. After power is turned off, the disks slow down, and (within 30 seconds) the heads move to a safe position. Any jolts to the drive during the power-down period may cause the heads to crash.
- Never drop a hard disk drive. Even a slight drop could cause drive failure.

Placement of the Hard Disk

When positioning an external hard disk with a computer, follow these rules:

- Do not block the air vents at the sides and back of the unit. These vents ensure proper ventilation while the hard disk is on.
- Always place hard disks right side up. Never place a Hard Disk SC on its side.
- Do not place a hard disk to the left of a computer. The left side of Apple computers contain power and video circuitry that could form a local magnetic field. This field could interfere with the normal operation of the hard disks.

Place hard disks flat, on the right hand side of the computer or above or below the computer. Figure 9 shows correct and incorrect ways to position the hard disks.

Setting Up an Apple External Hard Disk with an Apple II

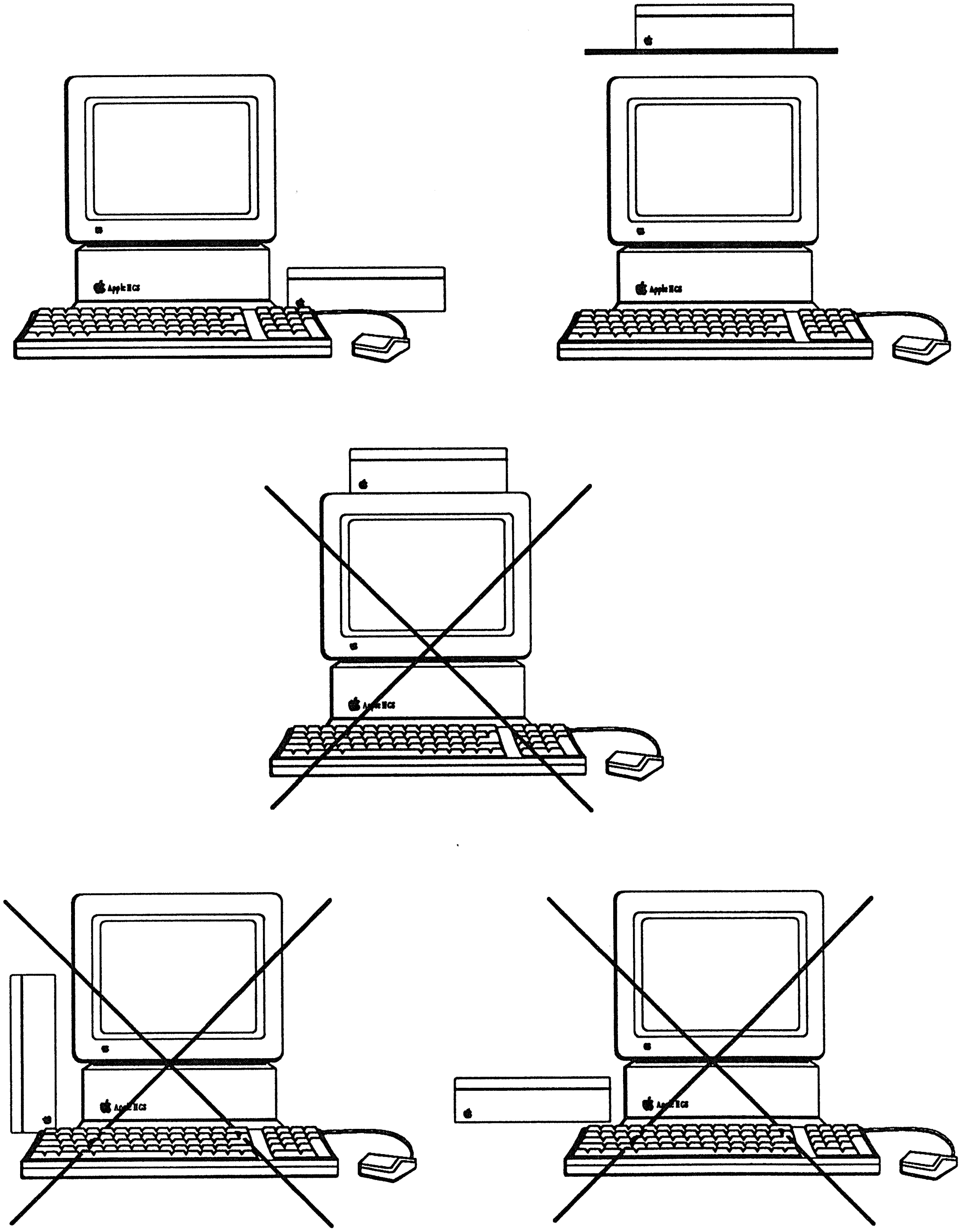


Figure 9. Correct and incorrect ways to position the hard disk with an Apple computer

Setting Up an Apple External Hard Disk with an Apple II

Installing the SCSI Interface Card

Before you can connect a Hard Disk SC to an Apple II computer, you need to install an Apple II SCSI Card. Steps 1 through 11 will guide you through the procedure for installing the SCSI interface card in the Apple IIGS.

If you have already installed an Apple II SCSI Card in your Apple IIGS (as directed in the module "Setting Up Apple II Computers") you can skip these steps and continue with step 12 — making cable connections.

Take proper ESD precautions throughout this procedure.

1. Make sure the computer's power is switched off.
2. Remove the computer's lid.
3. Decide which slot you are going to use (for this exercise you will use slot 7).

   With the Apple IIGS, you can insert the card into any slot except slot 3 (which would interfere with the video display). Later, you will use the Control Panel to indicate the startup device.

With the Apple IIe, you cannot set the startup slot with a Control Panel. The Apple IIe computer looks for a startup program in each drive—starting with the drive connected to the disk drive controller card in the highest-numbered slot. If you intend to designate a SCSI hard disk as the startup disk, you should put the SCSI card in a higher-numbered slot than any slots you have used for other disk drive controller cards.

If you do not intend to designate a SCSI hard disk as the startup drive, you should put the SCSI card in a lower-numbered slot than that of the card connected to the preferred startup device.

4. Remove the plastic cover from one of the large openings in the back panel of the computer, as shown in Figure 10.

   Choose an opening near slot 7 for the SCSI card.

Setting Up an Apple External Hard Disk with an Apple II

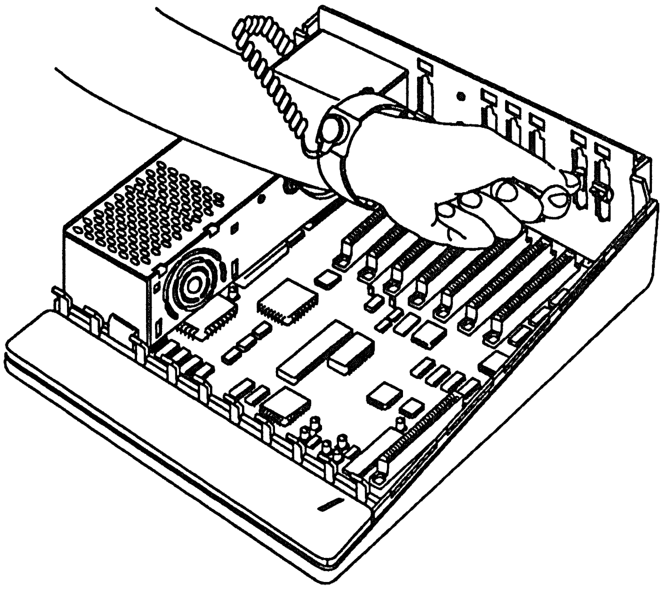


Figure 10. Removing the plastic cover from an opening on the back panel of the Apple IIGS

5. Attach the SCSI card cable to the inside of the back panel, as shown in Figure 11.

   Before inserting the card, attach the connector at the end of the ribbon cable to the inside of the back panel. Tighten the bolts using the small wrench that came with the SCSI card.

   By anchoring the connector to the back panel, you reduce stress on the cable and form a bond between the electromagnetic shielding on the computer's case and the shielding on the cable. This bond substantially reduces the possibility that the computer will generate radio-frequency interference.

Setting Up an Apple External Hard Disk with an Apple II

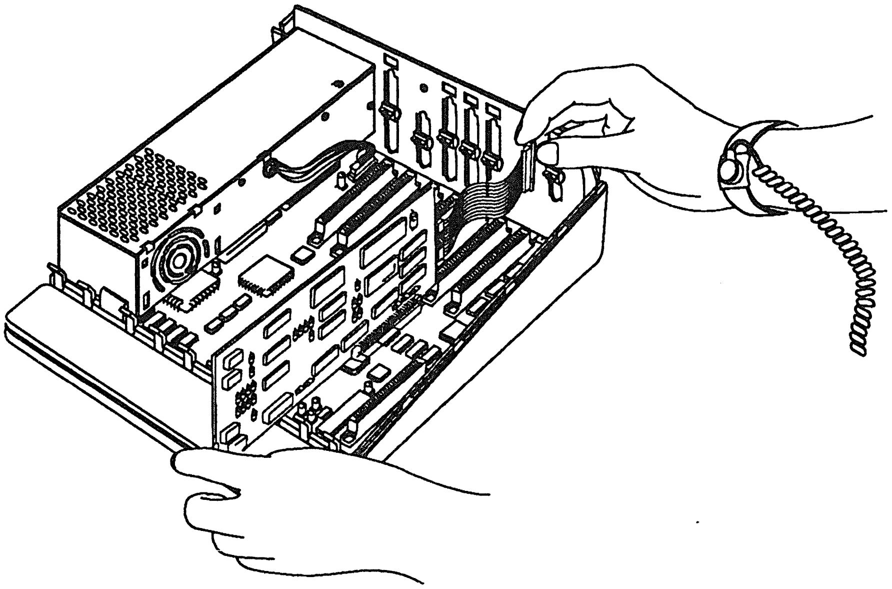


Figure 11. Connecting the ribbon cable

6. Make sure the jumper on the SCSI card is in the correct position.

   The jumper is the small rectangular box near the upper-left corner of the card. Make sure the jumper is fitted securely onto the pins farthest to the right, beneath the number 9, as shown in Figure 12. With the jumper in this position, the SCSI card has a SCSI priority of 7, which is the standard setting (factory setting). This means the computer will have top priority in any communication along the SCSI cable. **Note that the numbers 1-16 above and below the pins refer to the pins only and do not indicate the priority numbers.**

Setting Up an Apple External Hard Disk with an Apple II

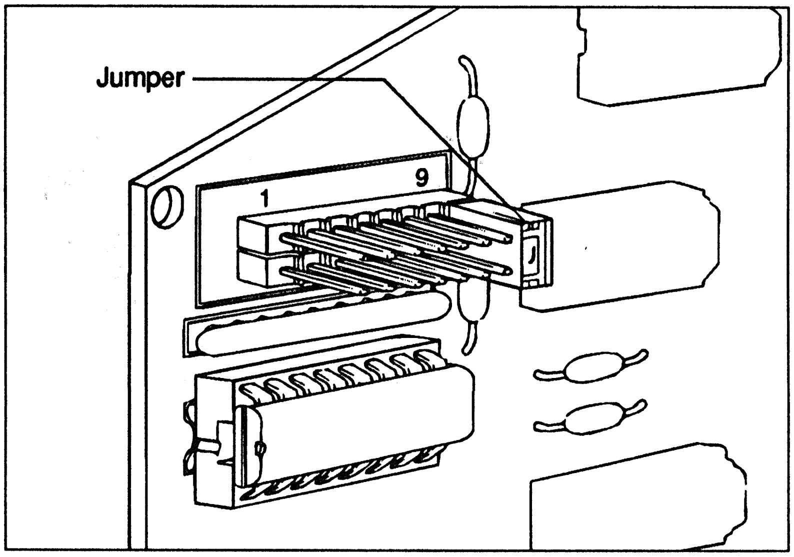


Figure 12. SCSI jumper in the standard position

7. Insert the card in slot 7.

   The gold "fingers" at the bottom of the card make the connection; avoid touching them. Make sure the side of the card with the integrated circuits faces away from the power supply, as shown in Figure 13.

   Insert the card into the slot. Rock it, firmly but gently, forward and back until it is seated in the slot. Do not wiggle it from side to side.

Setting Up an Apple External Hard Disk with an Apple II

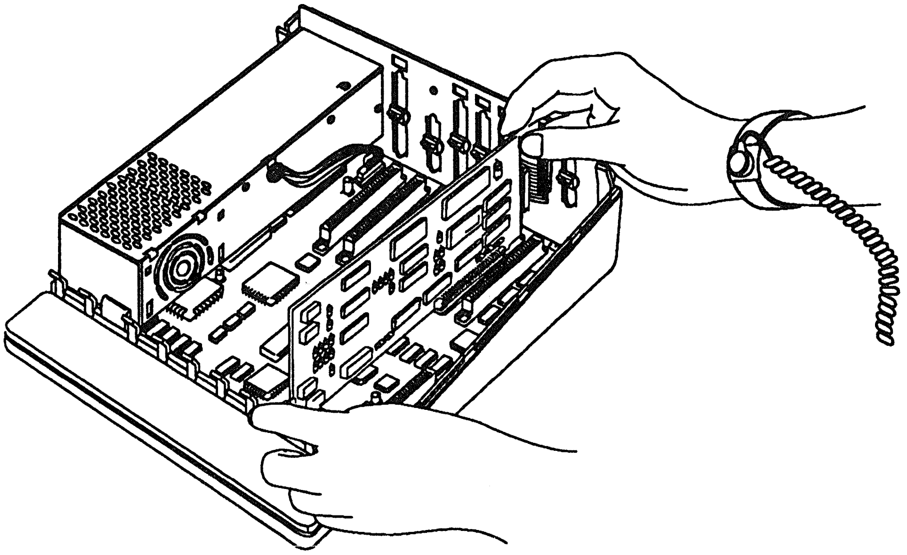


Figure 13. Inserting the card in the slot

8. Replace the computer's lid.

   Slip the front edge of the lid in first, then lower the back edge into place. Press down on the back corners of the lid until you hear the latches click shut.

Activating the Slot

Each port on the back of the Apple IIGS acts as a slot with a card in it. When you actually put a card into a slot, you need to use the Control Panel program to "turn off" the corresponding port and to turn on the slot. (For more explanation on activating slots, see the module *"Setting Up Apple II Computers."*) To activate the slot, you need to connect the monitor, keyboard, and mouse.

Note: *On the Apple IIe, slots are automatically active.*

Setting Up an Apple External Hard Disk with an Apple II

9. Now, connect the monitor, keyboard, and mouse.

10. Activate the slot that contains the SCSI card (slot seven).

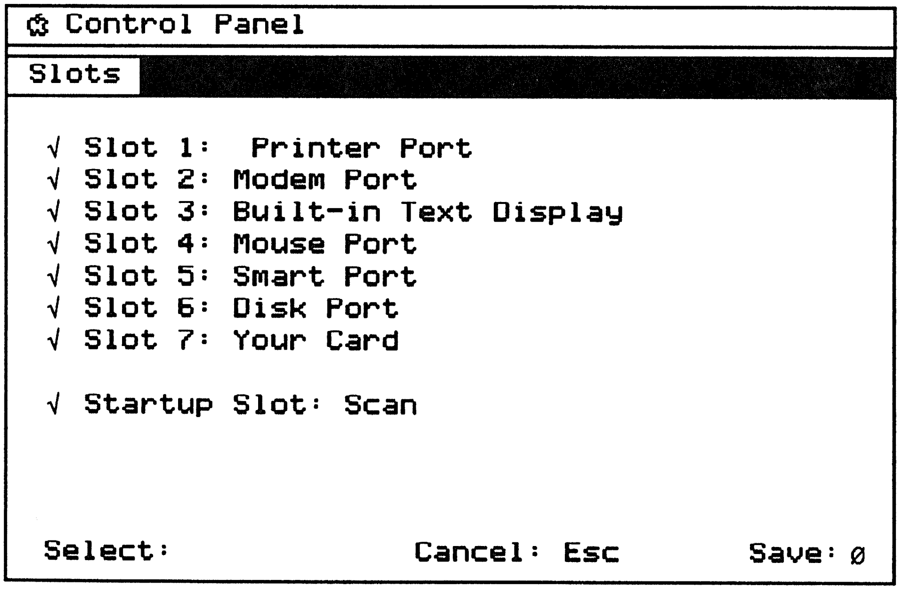
    You learned how to activate slots in the module *"Setting Up Apple II Computers."* Here are the basic steps. For more details about activating slots, you can review that module.

    a) Switch on the Apple IIGS power.

    b) Enter the Control Panel.

    c) Select Slots.

    You should see the display shown in Figure 14.



```
 Control Panel
Slots

 √ Slot 1:  Printer Port
 √ Slot 2: Modem Port
 √ Slot 3: Built-in Text Display
 √ Slot 4: Mouse Port
 √ Slot 5: Smart Port
 √ Slot 6: Disk Port
 √ Slot 7: Your Card

 √ Startup Slot: Scan

 Select:                 Cancel: Esc         Save: 0
```

Figure 14. Slots program display

Setting Up an Apple External Hard Disk with an Apple II

c. Select the slot that contains the SCSI Card (slot seven).

d. Select the description that says *Your Card.*

e. Press Return to save the setting. You will return to the Main Menu.

f. Choose Quit.

11. Switch off the Apple IIGS power.

Connecting the Hard Disk Cables

Now that you have installed the SCSI card and have activated the slot, you are ready to connect the hard disk to the Apple IIGS.

12. Place your Hard Disk SC to the right of the Apple IIGS.

13. Check the SCSI priority number (the SCSI priority switch). If necessary, change the number.

    The factory-setting is 5. Each device on a SCSI network must have a unique number. Usually higher numbers are assigned to hard disk drives. Unless you have reason to do otherwise, assign number 6 to the first Hard Disk SC, number 5 to a second one, and so on in descending order. (For further explanation on SCSI priority numbers, see the module *"Understanding SCSI."*)

    If you have to change the number, insert the point of a push pin or unwound paper clip into the hole below the priority switch, as shown in Figure 15. Push gently. The numbers increase. If you go past the number you want, keep pushing gently until you cycle around to your choice.

Setting Up an Apple External Hard Disk with an Apple II

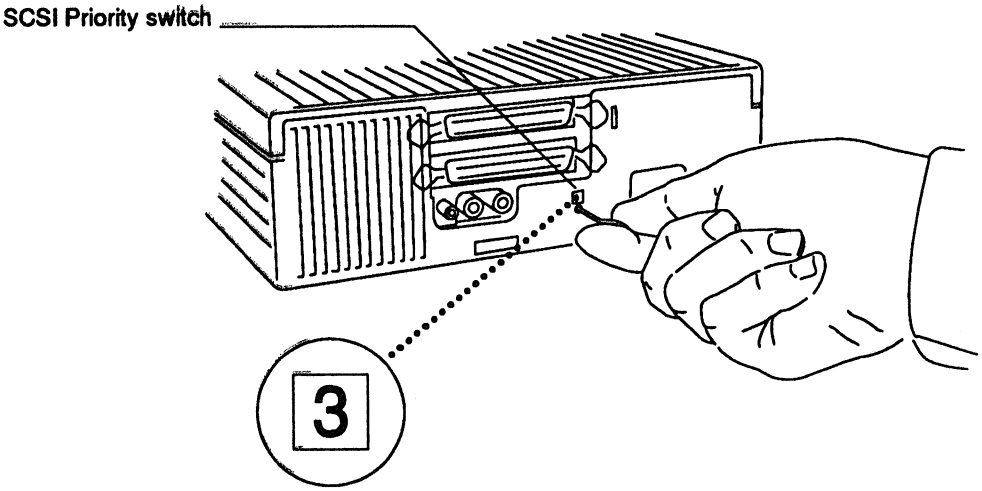


Figure 15. The Hard Disk SC priority switch

Steps 14 through 17 direct you to connect the SCSI System Cable and the Cable Terminator, as shown in Figure 16.

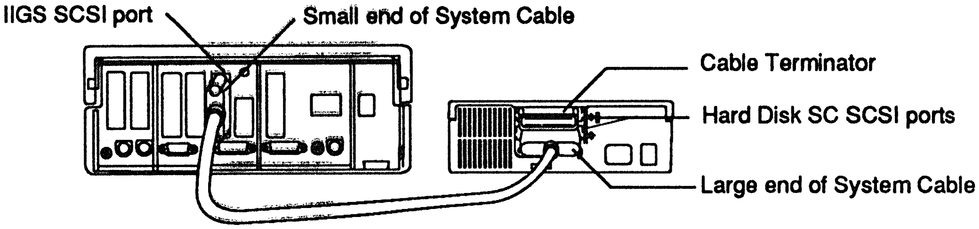


Figure 16. Apple IIGS correctly connected to a Hard Disk 20SC

Caution: *The Apple II power must be turned off when you connect any SCSI device.*

14. Without touching the metal pins in the SCSI connector, plug the DB-25 connector of the System Cable into the SCSI port on the Apple IIGS.

    Tighten the screws gently.

Setting Up an Apple External Hard Disk with an Apple II

15. Plug the terminator into the other end of the System Cable.

    Press the diamond-shaped wire clips toward the connector, and snap them into the clip brackets to secure the connection.

16. Plug the System Cable into either port on the back of the Hard Disk 20SC.

    Press the diamond-shaped wire clips toward the connector, and snap them into the clip brackets to secure the connection.

Be sure that both the computer and the hard disk are still turned off as you continue with the next step.

17. Connect the power cable to the hard disk and to a three-pronged power outlet.

Checking the Connections

Before you proceed with powering up the system, check your connections. If they are incorrect, you could damage the hard disk.

Powering Up the Hard Disk

Always power on the external hard disk before the computer. The disk motor needs to spin up to operational speed before the drive is ready to be accessed by the computer.

When you power up an Apple Hard Disk SC, the LED at the front of the hard disk will light briefly, then go out. The hard disk will whir. When all circuits are ready and the motor speed is constant (10 to 20 seconds), the drive is ready for operation. Depending on the manufacturer and model, the hard disk may emit one or more quiet beeps when it is ready for operation.

The LED does not come on steady when the drive is ready. The LED blinks when the hard disk is reading or writing data; otherwise the light remains off even though the hard disk is on.

18. Now power on the hard disk. Watch and listen for indications that it is starting up.

    Do not turn on the Apple IIGS yet.

Setting Up an Apple External Hard Disk with an Apple II

Initializing the Hard Disk

Right out of the box, all Apple hard disks are completely blank. The computer will not even recognize the hard disk as being a storage volume. The hard disk must be prepared to receive information. This process is called initialization. When you initialize a hard disk, the computer's operating system writes code to the hard disk drive that identifies it as a hard disk, capable of storing data.

Initializing a disk does four things:

- Completely erases any data on the disk
- Formats the hard disk to store data
- Runs a test to verify that the hard disk is OK
- Installs the driver program, which lets the computer and the hard disk send and receive files

Tracks and Sectors

As explained in the *"Using Apple II Computers"* module, when you initialize or format a hard disk, the magnetic surface of the disk is divided into concentric circles called tracks, and each track is divided into sectors as shown in Figure 17. This grid of tracks and sectors is set up so that the computer's operating system can locate data on the hard disk.

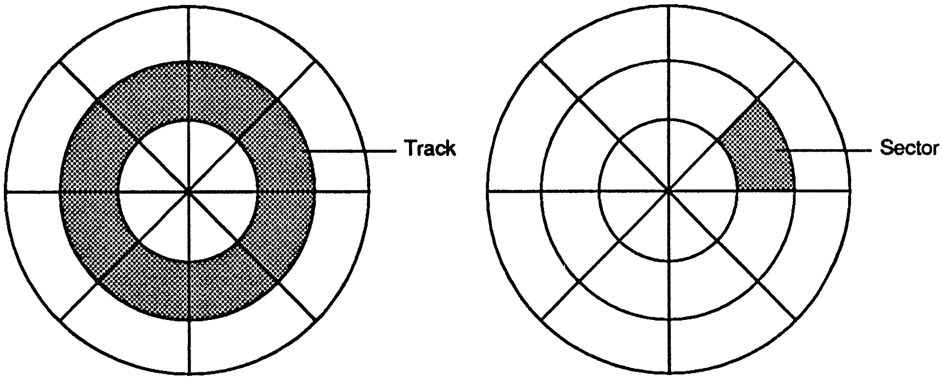


Figure 17. Tracks and Sectors on a disk

Setting Up an Apple External Hard Disk with an Apple II

Interleave Ratio

Interleave ratio is the ratio of consecutive sectors on a disk that a computer can read from or write to. The interleave ratio differs across different types of computers. Generally, computers with faster speeds have higher interleave ratios. For example, assume these Apple computers have the following interleave ratios:

Computer	**Interleave Ratio**	**Speed**
Apple IIe	3:1	fast
Macintosh SE	2:1	faster
Macintosh II	1:1	fastest

This means that the Macintosh II is fast enough to read from or write to every consecutive sector, the Macintosh SE can only read or write on every other sector, and the Apple IIe is only fast enough to read or write on one in every three sectors.

Performance delays occur when you connect a "slower" computer to a hard disk initialized on a "faster" computer. For example, a hard disk intialized on a Macintosh II has data on more consecutive sectors than a Macintosh Plus can consecutively read. The Macintosh Plus would have to complete a second full revolution of the disk to access the sectors it missed on the first revolution. There is also a delay when the "faster" computer accesses a hard disk intialized by the "slower" computer.

To get maximum performance from a hard disk, use the hard disk only with the computer it was initialized on. If you need to use a hard disk with another computer (other than the one it was initialized on), back up the data and reinitialize the hard disk with the computer you plan to use.

Overview of the Initialization Procedures

Initializing a Hard Disk SC for use with an Apple IIGS computer involves three procedures:

1) Install the appropriate "update" files on the startup disk.

   The update file(s) are device driver files that enable the computer to communicate with the hard disk.

2) Divide the hard disk into multiple storage areas called "partitions," if appropriate.

   If the hard disk is larger than 32MB, you must partition the hard disk to use all of the storage space. Other reasons for partitioning a hard disk will be described later in this section.

Setting Up an Apple External Hard Disk with an Apple II

3) Initialize the hard disk or each partition of the hard disk.

   If you do not have to partition the hard disk, you can initialize it immediately after installing the update. If you need to partition the hard disk, you do that first and then initialize each partition.

The rest of this section will provide more details about each of these procedures and guide you through the steps to perform them with your Apple IIGS and Hard Disk SC.

Installing the Update

Before the Apple IIGS can communicate with the Hard Disk SC, you need to install the appropriate update on the startup disk that you will use with the hard disk. As explained in the *"Using Apple II Computers"* module, updates are files that the Apple IIGS computer needs for particular purposes, for example, to communicate with specific peripheral devices.

You use the Installer program on the Apple IIGS System Tools disk to install update files on startup disks.

Your hard disk should be warmed up by now, so you can continue with Steps 19 through 27, which will guide you through the procedure for installing the update required by the Hard Disk SC.

19. Start up the computer with the Apple IIGS System Disk.

    Insert the system disk in the startup drive, switch on the monitor, and then switch on the computer.

Important Note: *You will get a dialog box stating the SCSI Hard Disk requires a driver. You are about to install the driver so press Return to continue.*

20. Insert the Apple IIGS System Tools disk.

    If you have only one 3.5-inch disk drive, eject the system disk and insert the System Tools disk in its place. You will need to swap disks occasionally during this procedure; simply follow the instructions on the screen whenever the computer prompts you to insert the other disk.

    Important: *The Installer will not recognize the System disk or the System Tools disk as the source of any updates to be installed unless the disk is named SYSTEM. DISK or SYSTEM.TOOLS. If you have renamed either disk, or if you are working with a backup copy with a different name, be sure to change the name to SYSTEM.DISK or SYSTEM.TOOLS before proceeding with the installation.*

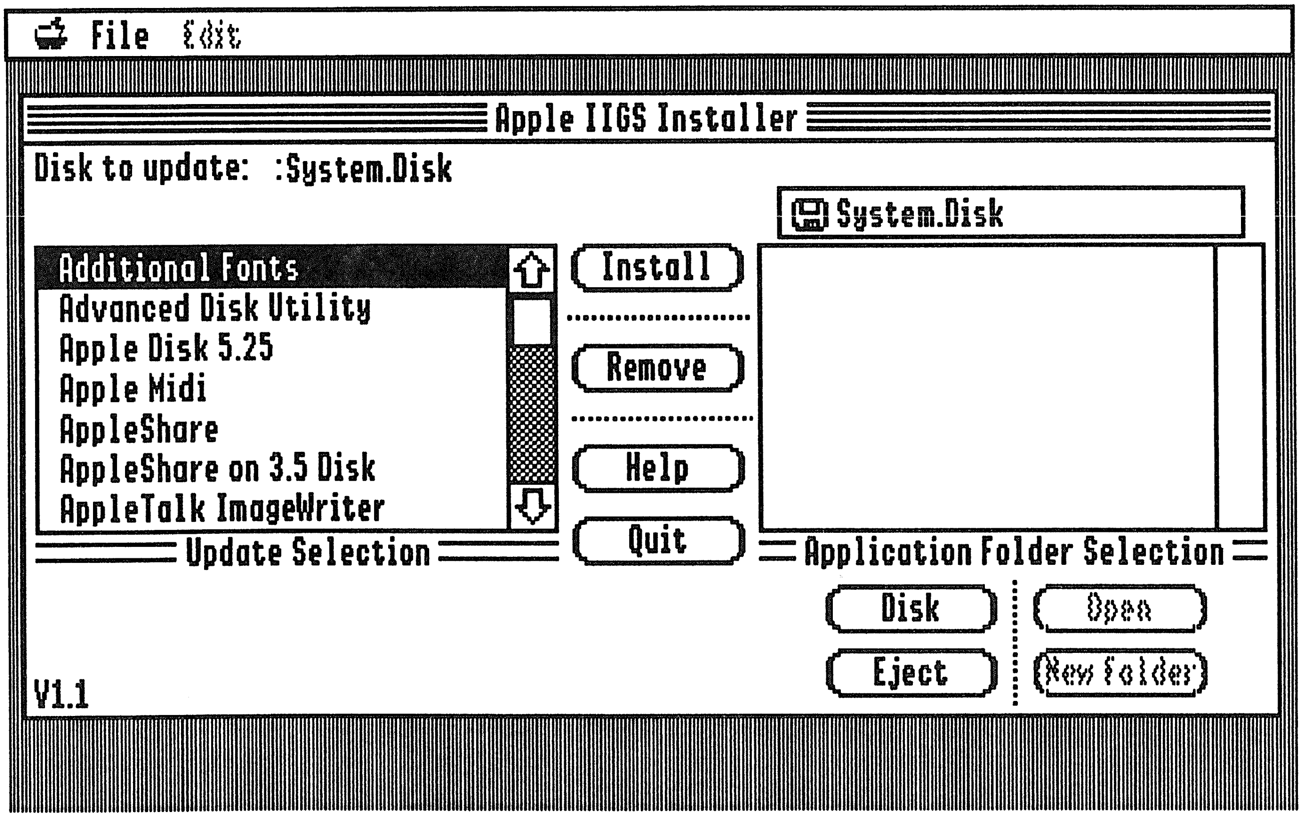
Setting Up an Apple External Hard Disk with an Apple II

21. Open the System Tools disk.

    Select the disk icon labeled SYSTEM.TOOLS and choose Open from the File menu, or just double-click the icon.

22. Open the Installer program.

    In a moment you will see the screen shown in Figure 18.



Disk to update: :System.Disk

Figure 18. Apple IIGS Installer dialog box

Select a Script

The window on the left displays an alphabetical list of the scripts for all the updates available on the System Tools disk. A script is a set of instructions that the Installer follows to transfer a file or set of files from one disk to another. The window on the right corresponds to the startup disk currently selected to receive updates—in this case, the System disk.

Setting Up an Apple External Hard Disk with an Apple II

If you wanted to install the update(s) on a different startup disk than the one shown in the dialog box, you could select the different disk. First, you would have to insert the desired disk in a disk drive. Then you could select the new disk by clicking the Disk button until the desired disk is selected.

24. Select the script for the update you want to install on the selected disk.

    In this case, you want the script "SCSI Hard Disk." You may need to scroll through the window to find the script.

    If you want more information about a script, select the script and click the Help button. You will see a description of what the selected update will accomplish.

Install the Update

25. Click the Install button to install the selected update on the selected disk.

    A dialog box shows a series of messages to indicate the progress of the installation process, and the "thermometer" indicator gives a visual representation of the progress.

Important: *Canceling the installation procedure may result in a number of incompatible files—some old and some new. Once you have begun an installation, it is generally best to let it proceed.*

26. When the installation is complete, Click OK.

    If you needed to add other updates to a startup disk, you would repeat the installation steps as many times as necessary, and then quit the Installer.

27. Click Quit and then click Restart System.

    The computer does not recognize the newly installed updates on a startup disk until you restart the computer with that disk.

Setting Up an Apple External Hard Disk with an Apple II

Initializing a Disk Without Partitions

Now that you have installed the appropriate update, you are ready to initialize the hard disk. If you are working with a Hard Disk 20SC, follow steps 28A through 36A to initialize it.

If you are working with a Hard Disk 40SC, 80SC, or 160SC, you need to partition the disk before you can initialize it. Skip to the part "Partitioning a Hard Disk," provided later in this section. Steps 28B through 46B will guide you through the procedures for partitioning a disk and initializing the partitions.

Your computer should be on, with the System disk serving as the startup disk.

Note: *If the hard disk you are using isn't new, at the desktop, you may get a dialog box stating GS/OS does not recognize the file system on the hard disk and asks if you want to initalize it. You want to use the Advanced Disk Utility to initialize, so for now, click Eject. (You may get this dialog box twice, click Eject both times.)*

28A. If necessary insert the Apple IIGS System Tools disk.

29A. Open the System Tools disk.

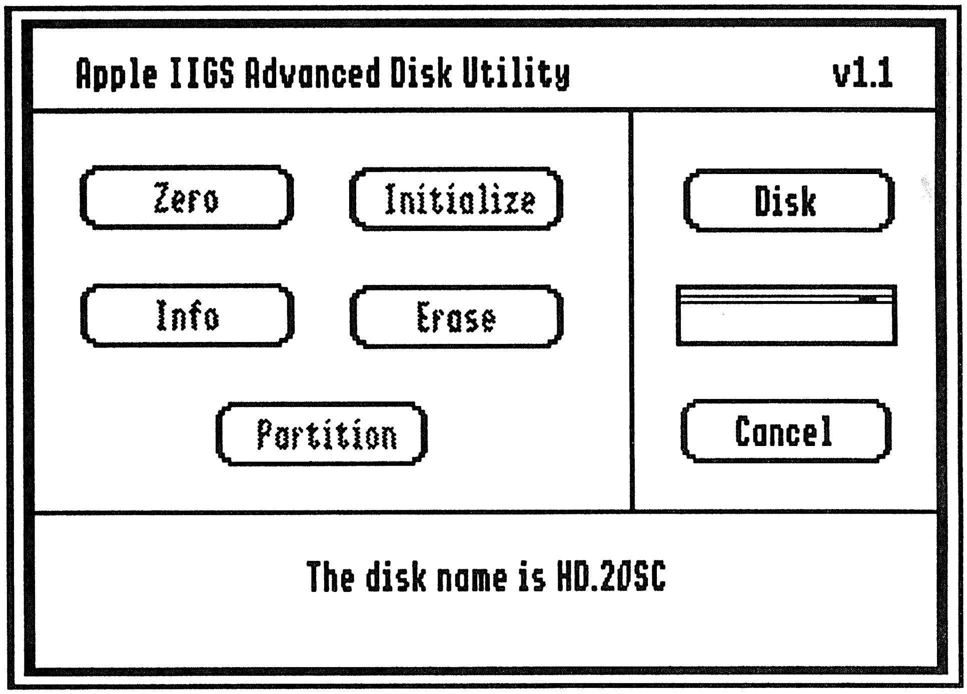
30A. Open the icon labeled ADV. DISK.UTIL (Advanced Disk Utility program).

You will see the Advanced Disk Utility information screen which lists the version number, author, and copyright information for the program.

31A. Choose Initialize/Erase from the File menu.

You will see the Advance Disk Utility dialog box, as shown in Figure 19.

Setting Up an Apple External Hard Disk with an Apple II



The disk name is HD.20SC

Figure 19. The Advanced Disk Utility dialog box

The Advanced Disk Utility Screen

Notice that beneath the Disk button is an icon representing the type of disk selected. At the bottom of the screen is a message giving the name of the selected disk. (If you have been following the steps in this section, the startup disk should be your current disk selected.)

If the selected disk is write-protected, you will see the icon of a padlock to the left of the disk icon. If that is the case, all options except Info and Cancel will be dimmed because you cannot alter a locked disk.

Setting Up an Apple External Hard Disk with an Apple II

Here is a description of three of the buttons on this dialog box. The Partition, Erase, and Zero buttons will be explained later in this section.

Info button – When you click this button, a dialog box provides information about the selected disk.

Cancel button – Clicking this button returns you to the opening screen of the Advanced Disk Utility, where you can quit the program. Pressing the Esc (Escape) key has the same effect as clicking Cancel.

Disk button – Clicking this button selects the next available disk. The name listed at the bottom of the Advanced Disk Utility screen changes to the name of the new disk and, if the disk is a different type from the previous one, the disk icon also changes.

If you click the disk button but do not see the hard disk, one of the following situations could exist:

- The appropriate update has not been installed on the startup disk
- The hard disk was not switched on when you started or restarted the computer
- The slot in which the corresponding SCSI card is installed is not activated in the Slots menu of the Control Panel

Select the Disk to Be Initialized

32A. Select the disk you want to initialize by clicking the Disk button.

Click the Disk button until the name of the disk you want to initialize appears at the bottom of the Advanced Disk Utility screen.

Important Note: *If you are using a hard disk that has been previously initialized or used, you should Zero the hard disk before initializing it. To Zero the hard disk, click Zero and follow the instructions in the dialog boxes that are presented on screen.*

33A. Click Initialize.

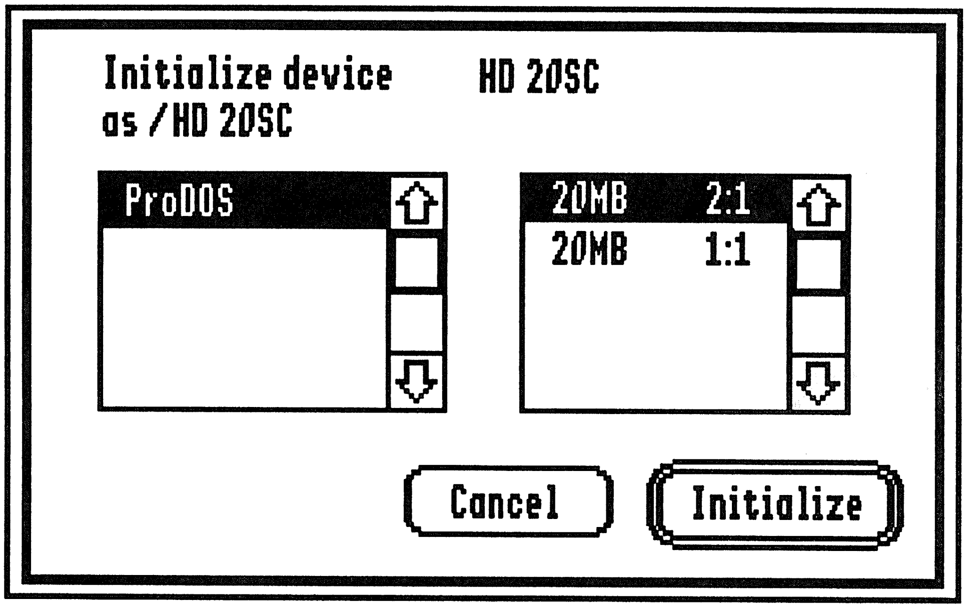
A dialog box appears asking you to name the disk.

Name the Disk

34A. Specify a name for the disk, and then click OK or press Return.

You will see the Initialize dialog box, as shown in Figure 20.

Setting Up an Apple External Hard Disk with an Apple II



Initialize device HD 20SC as /HD 20SC

ProDOS

20MB 2:1
20MB 1:1

Figure 20. The Initialize dialog box

Select the File System

The window on the left lists each file system for which there is a File System Translator (FST) on the startup disk. Because you are initializing a hard disk, the window on the right shows the size of the disk. (When you initialize 3.5-inch diskettes, this window shows possible disk formats.)

35A. If necessary, select a file system for the disk.

> If you have not installed any additional FSTs, the only file system listed in the window on the left is ProDOS. If that is the case, skip this step; ProDOS will automatically be selected.

Setting Up an Apple External Hard Disk with an Apple II

Initialize the Disk

36A. Click Initialize or press Return.

After a few moments, you will return to the Advanced Disk Utility screen. A message at the bottom of the screen tells you whether the initialization was successful.

37A. Click on Cancel.

38A. Select Quit from the File menu to leave the Advanced Disk Utility program.

Partitioning divides the hard disk into storage areas. Using the Advanced Disk Utility program provided on the Apple IIGS System Tools disk, you can define up to seven different partitions on the hard disks connected to a single SCSI card.

Partitioning a Disk

The two main reasons for partitioning a hard disk are:

1) You can initialize each partition for a different file system, allowing you to store applications and documents that use different file systems on the same hard disk.

2) If you have a hard disk larger than 32MB and you want to initialize it for use with ProDOS applications, you can use partitions to take advantage of the disk's full storage space. ProDOS file system limits volume size to 32MB, so unless you partition a hard disk that has greater storage capacity, any space over 32MB is wasted.

Reasons for Partitioning a Disk

You should always decide in advance how many partitions you want to create on a hard disk and what the names and sizes of those partitions will be. **Once you have partitioned a hard disk, you cannot add, delete, resize, or rename a partition without repeating the entire process—which erases all data on the disk.** If you must repartition a hard disk, be sure to make a backup copy of everything on the disk first.

Create only as many partitions as you really need. Using a lot of partitions can slow down the computer's access to information on the disk.

Plan the Partitions Carefully

Steps 28B through 46B provide directions for partitioning a hard disk and initializing the partitions. If you are working with a Hard Disk 20SC and have already initialized it, you do not have to perform these steps. You can skip over these steps and continue with the part "Creating a Startup Disk." You may, however, want to read through the following steps to become familiar with the partitioning procedure.

Setting Up an Apple External Hard Disk with an Apple II

The Partitioning Procedure

If you are working with a hard disk that has more than 20MB of storage space, you should perform the following steps to partition and initialize the hard disk.

These steps assume that you have already installed the appropriate update on the startup disk. Your hard disk should already be warmed up and you should have already booted the computer with the Apple IIGS System Disk.

28B. Insert the Apple IIGS System Tools disk.

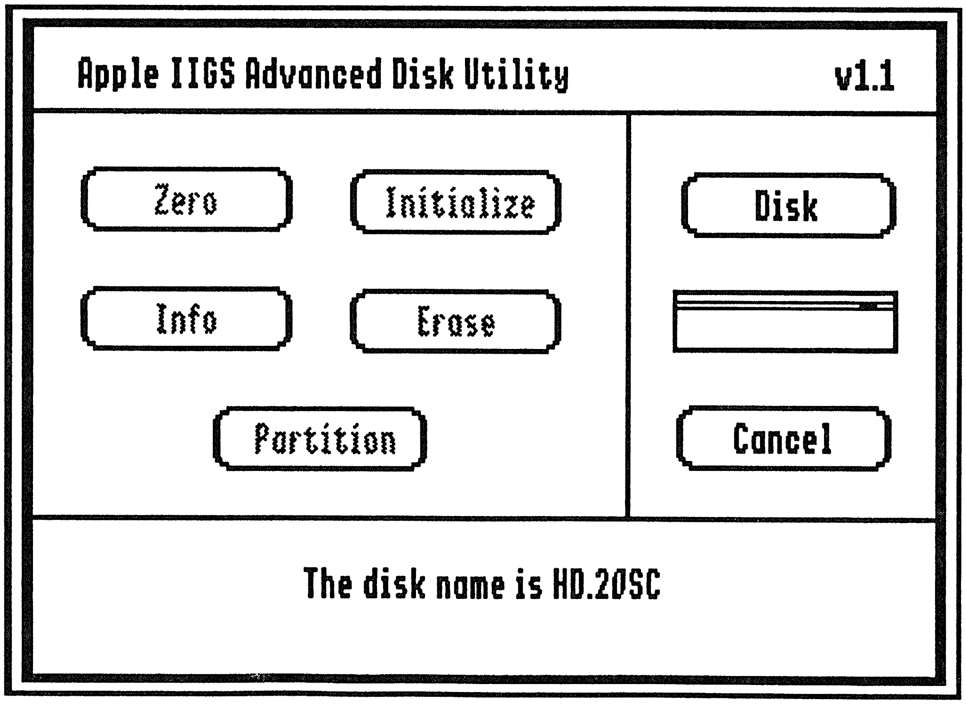
29B. Open the system tools disk.

30B. Open the icon labeled ADV. DISK.UTIL (Advanced Disk Utility program).

You will see the Advanced Disk Utility information screen which lists the version number, author, and copyright information for the program.

31B. Choose Initialize/Erase from the File menu.

You will see the Advance Disk Utility dialog box, as shown in Figure 21.



The disk name is HD.20SC

Figure 21. The Advanced Disk Utility dialog box

Setting Up an Apple External Hard Disk with an Apple II

The Advanced Disk Utility Screen

Notice that beneath the Disk button is an icon representing the type of disk selected. At the bottom of the screen is a message giving the name of the selected disk. (If you have been following the steps in this section, the startup disk should be your current disk selected.)

If the selected volume is write-protected, you will see the icon of a padlock to the left of the disk icon. If that is the case, all options except Info and Cancel will be dimmed because you cannot alter a locked disk.

Here is a description of three of the buttons on this dialog box:

Info button – When you click this button, a dialog box provides information about the selected disk.

Cancel button – Clicking this button returns you to the opening screen of the Advanced Disk Utility, where you can quit the program. Pressing the Esc (Escape) key has the same effect as clicking Cancel.

Disk button – Clicking this button selects the next available disk. The name listed at the bottom of the Advanced Disk Utility screen changes to the name of the new disk and, if the disk is a different type from the previous one, the disk icon also changes.

If you click the disk button but do not see the hard disk, one of the following situations could exist:

- The corresponding device requires an update that has not been installed on the startup disk
- The hard disk was not switched on when you started or restarted the computer
- The slot in which the corresponding SCSI card is installed is not activated in the Slots menu of the Control Panel

Select the Hard Disk

32B. Select the hard disk you want to partition by clicking the Disk button.

If the hard disk has not yet been initialized, the message at the bottom of the screen says "Uninitialized or no disk in drive."

Setting Up an Apple External Hard Disk with an Apple II

Plan the Partitions

Before you continue, you should plan the partitions—how many do you need? How large should each partition be? What will you name each partition? What file system will each one use? The following example shows how a 40MB disk was divided into four partitions to meet the needs of one user.

Partition Name	Partition Size	File System
Sales	15MB	ProDOS
Marketing	10MB	ProDOS
Editorial	5MB	ProDOS
Production	10MB	ProDOS

Note that these four partitions use up all of the 40MB of storage space available on the hard disk. You may use this example to partition your hard disk in this exercise. If you want to create your own partition plan, do so now. You can write it down in the spaces provided below. For now, plan to use ProDOS as the file system for each partition.

Partition Name	Partition Size	File System

33B. Click Partition.

You will see a dialog box reminding you that partitioning will destroy all data on the device and asking whether you really want to partition the device.

Setting Up an Apple External Hard Disk with an Apple II

34B. Click OK to continue with the partitioning operation.

You will see the dialog box shown in Figure 22.

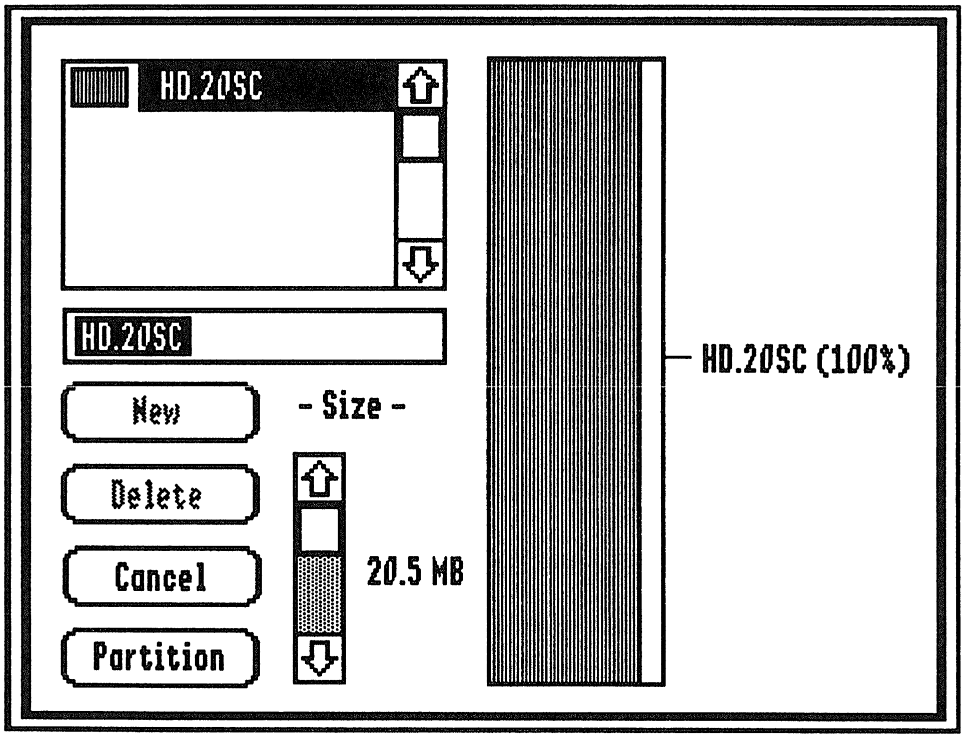


Figure 22. The Partition dialog box

> **Important:** *The Partition dialog box also has a button labeled Partition. This button saves all changes you make in the Partition dialog box. Do not click this button until you have created, named, and sized all the partitions you want. Once you click this button, you will not be able to add, delete, rename, or resize any partitions without starting the partitioning process over from scratch.*

Setting Up an Apple External Hard Disk with an Apple II

Name a Partition

When the Partition dialog box first appears, it includes only one partition, called UNTITLED1. (If the hard disk has been partitioned before, you will see the names of all the existing partitions.) This name appears both in the partition list (the window in the upper-left corner and in the name box below the partition list.

35B. Name the partition.

Type one of the names you plan to assign to your partitions, for example, Sales. The name should conform to the naming conventions of the file system you will be using for the partition. Each partition must have a different name.

36B. When the partition name appears the way you want it, press Return. The new name replaces UNTITLED1 in the partition list.

Set the Partition Size

37B. Now set the size for the new partition.

The scroll bar to the right of the four buttons lets you set or change the size of the selected partition.

To set or change the size, reposition the scroll box within the scroll bar by dragging the scroll box or clicking the scroll arrows or scroll bar. You can set partition size in increments of 0.5MB.

If you are following the example partition plan given above, set the size for the Sales partition at 15MB.

38B. Click New to accept the first partition.

Notice that the bar at the right of the window displays the newly created partition. As you continue to partition the hard disk, this bar graph will show how the space on the hard disk is divided up. A different color (or shade of gray if you have a monochrome monitor) is used for each partition you create.

Note also that another UNTITLED partition appears in the upper-left window.

Setting Up an Apple External Hard Disk with an Apple II

Create Remaining Partitions

39B. Create additional partitions.

Repeat steps 35B through 38B to create additional partitions.

When you have completed creating these partitions, the window in the upper left should list all of the partitions. The bar to the right should indicate the sizes of the partitions. For the example given above, the dialog box would look like the one in Figure 23.

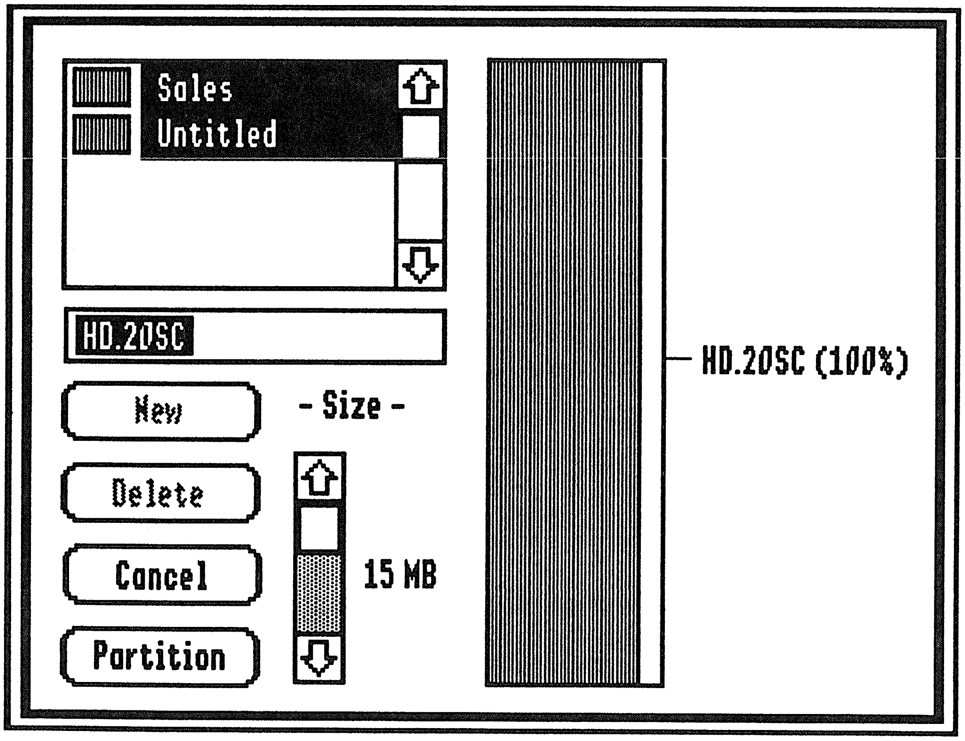


Figure 23. The Partition dialog box displaying partitions

Setting Up an Apple External Hard Disk with an Apple II

40B. Make any final changes to partition names and sizes.

At this point, you can still change the names and sizes of the partitions. Select the name in the partition list and make the necessary change(s).

If you have already allocated all the space on the hard disk and then decide that you want to enlarge a partition, you will first have to select a different partition and reduce its size accordingly.

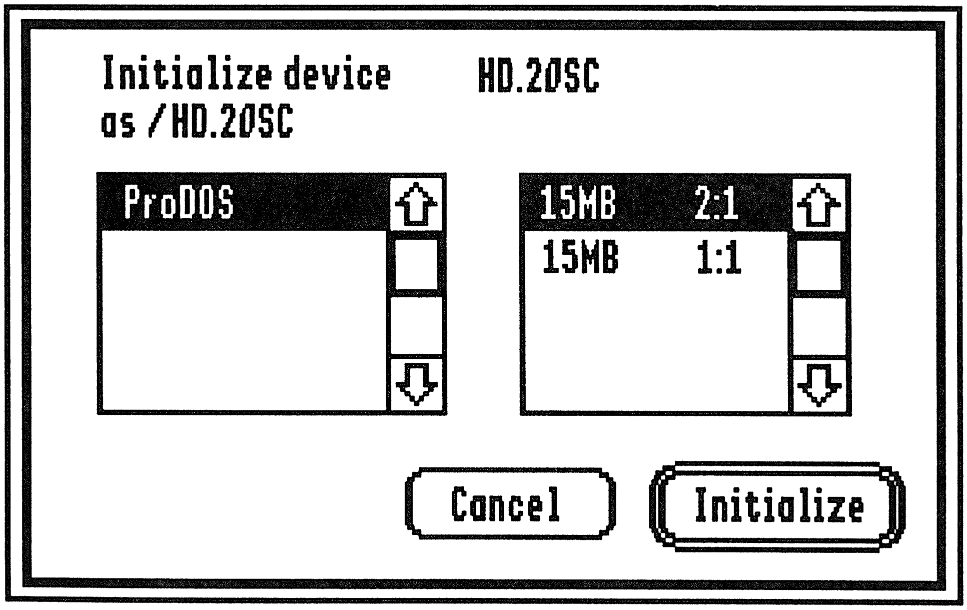
If you want to eliminate a partition altogether, simply select its name in the partition list and click Delete. You can delete all but one partition.

Important: *Make sure that you have allocated all the space on the hard disk. Any space left unallocated when you click Partition will be wasted space—unless you go back and repartition the entire hard disk, erasing all the data on the disk in the process.*

Initializing the Partitions of a Disk

41B. Click Partition.

The Initialize dialog box, as shown in Figure 24, appears for the first partition.



Initialize device HD.20SC
as /HD.20SC

Figure 24. The Initialize dialog box

Setting Up an Apple External Hard Disk with an Apple II

The window on the left lists all file systems for which you have installed a file system translator (FST) on the startup disk. The window on the right shows the size you assigned to the partition about to be initialized.

42B. If necessary, select a file system for the partition.

If you have not installed any additional FSTs on the startup disk, the only file system listed in the window on the left is ProDOS. If that is the case, skip this step; ProDOS will be selected automatically.

43B. Click Initialize or press Return.

The partition is initialized for use with the file system you selected (or for use with ProDOS if you didn't select a different file system.)

After a moment, the Initialize dialog box appears for the next partition.

44B. Repeat steps 42B and 43B for each additional partition.

When you have initialized the last partition, you will see to the Advanced Disk Utility screen again. A message at the bottom of the screen tells you whether the partitioning was successful.

45B. Click on Cancel.

You should see the blank screen of the Advanced Disk Utility.

46B. Select Quit from the File menu to return to the Finder desktop.

Creating a Startup Disk

If the hard disk is to be used as a startup disk, the next step is to load the required system files onto the disk. A startup disk is any disk—floppy or hard—that contains all the software files necessary to boot the computer.

The procedure for making a hard disk a startup disk is the same as making a floppy disk a startup disk. You copy all of the required startup files to the hard disk.

Setting Up an Apple External Hard Disk with an Apple II

Having initialized your hard disk, you can now make it a startup disk.

47. Copy the the System Folder, Icons Folder, ProDOS file and any other required startup files to the hard disk. (If the system has multiple hard disks, copy the files to the disk designated for startup.) This one step makes the hard disk a startup disk. (When using partitions, the first partition created should be the startup disk.)

When preparing the hard disk for normal use, you would also copy applications and documents onto the hard disk. For this exercise, you do not have to perform this step.

If applications are copy protected, you may not be able to copy them to the hard disk, or you may be asked to insert a master disk in the internal disk drive each time you start up the hard disk.

48. Now switch off the computer and the monitor.

49. Switch off the hard disk.

Switching on an Apple II

When you start up the Apple IIgs, the computer looks for startup information in the slot you have designated for startup. Be sure to set the slot the hard disk is connected to as the startup slot in the Control panel. With an Apple IIe, the computer looks for the startup information in each disk drive, starting with the disk drive connected to the disk-drive controller card in the highest slot number.

After setting the Control Panel, try booting from the hard disk.

50. Switch on the hard disk.

51. Wait at least 10 seconds while the hard disk warms up.

52. Switch on the Apple IIgs and the monitor.

When switching on an Apple II with a hard disk, always follow the three steps given above. **Always allow the hard disk to warm up before you start the computer.**

If the Apple IIgs successfully boots from the hard disk, the icon for the hard disk will appear in the upper right hand corner of the desktop—indicating that the hard disk is the current startup device, as shown in Figure 25.

Setting Up an Apple External Hard Disk with an Apple II

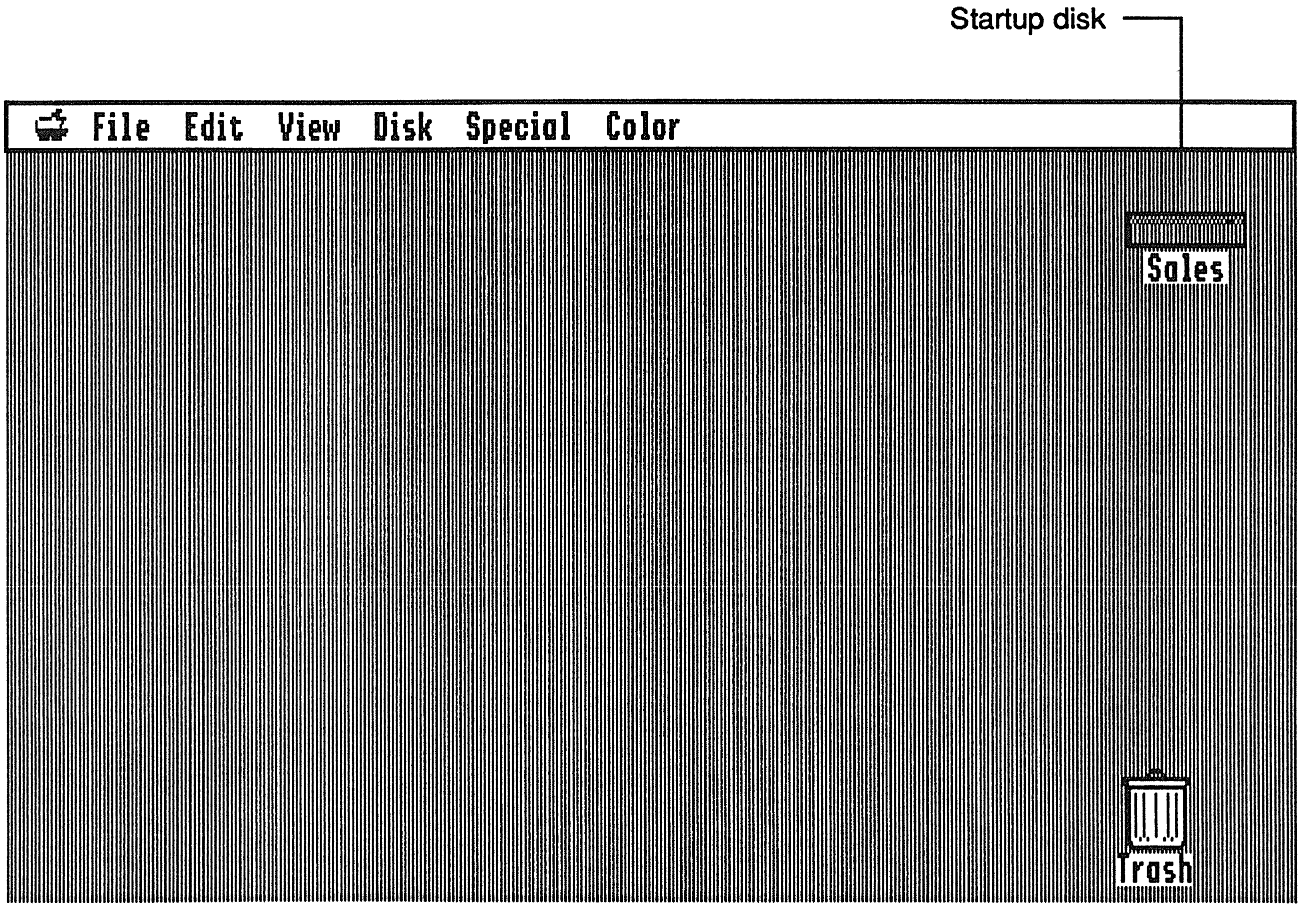


Figure 25. Icon in upper right corner indicates the startup disk

Power Down

Because the SCSI hard disk draws very little power, you can leave it on and unused for several days. When you will not be using it for a week or more, or when you want to connect it to (or disconnect it from) the computer or another SCSI hard disk, you should switch it off. Whenever you power off a hard disk, always follow these three steps:

1) Quit the application you are working in and return to the desktop or the operating system prompt.

2) Switch off the computer.

3) Switch off the SCSI hard disk.

Important: *Never switch off the SCSI hard disk while the light is blinking. You may lose information on the hard disk.*

Setting Up an Apple External Hard Disk with an Apple II

Adding More Than One Hard Disk

You can add one or more SCSI Hard Disks to your system by attaching them with an SCSI peripheral interface cable (and an SCSI cable extender or cable terminator, if necessary).

To connect a second SCSI hard disk to the original one, follow these steps: (You do not have to perform these steps now.)

1) Switch off the computer and all hard disks.

2) Connect the second hard disk to the first hard disk. Use the appropriate SCSI cables and terminator.

   Notice that the second hard disk connects to the first, not to the computer, as shown in Figure 26.

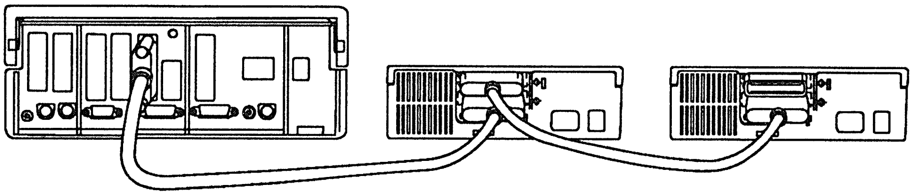


Figure 26. Connecting two hard disks to an Apple IIGS

3) Switch on hard disks in any order.

4) When they have each been on at least 10 seconds, switch on the computer.

5) Insert the operating system disk in drive 1 of the Apple II system.

6) Repeat the initialization procedure. You do not copy the system startup files to the second hard disk unless you want to make it a startup disk.

If you are connecting more than two SCSI hard disks, connect the third one to the open SCSI port on the second Hard Disk SC. Connect the fourth Hard Disk SC to the open SCSI port on the third Hard Disk SC. Do not forget to initialize each hard disk.

Setting Up an Apple External Hard Disk with an Apple II

Erasing a Hard Disk

Erasing a disk removes the directory—the list of files on the disk. When you open the disk icon on the desktop, it will appear that there are no longer any files on the disk because the directory is what lets you see any files on the disk. The files are still there; but without a directory they are invisible—inaccessible, unless you know how to manipulate the data on a disk without a disk directory.

Erasing is faster than initializing because the computer does not need to wipe out the disk's data organization structure and create a new structure.

If you want to remove all the files from a disk and you plan to use the disk again with the same file system (or a different file system that uses the same layout of tracks and sectors), you should erase the disk. If, on the other hand, you want to use the disk with a file system that requires a different layout of tracks and sectors, you should re-initialize the disk.

Zeroing a Hard Disk

If you want to completely destroy the data on a disk so that no amount of manipulation can recover it, you should zero the disk. Unlike erasing, zeroing removes not only the disk directory, but also all the files and the file system. After zeroing, a disk must be initialized again before it can receive new data.

Because zeroing involves writing over everything on a disk, it can take a long time. As a result, you probably will not want to zero disks unless you have a good reason to do so.

References

Here are some references that you might want to look at for more details about setting up Hard Disk SCs with Apple II computers:

- Apple Hard Disk SC Manual
- Apple IIGS System Disk User's Guide
- Apple IIGS System Tools Disk User's Guide
- Apple II System Utilities Manual
- ProDOS User's Manual
- How to Install Your Apple II SCSI Card manual
- Apple SCSI Cable System manual
- AppleService Technical Procedures manuals

Continue with the next section - Module Summary.

Module Summary

Advantages of Hard Disks

Hard disks have two key advantages over floppy disk drives:

1) Hard disks can store many times more data than floppy disks.

2) Hard disk drives read and write data much more quickly than can floppy disk drives.

Hard Disk Uses

Users can store system software, applications, documents, fonts, and DAs on their hard disks. This eliminates the need to switch from one diskette to another while working with the computer.

Placing the System File and Finder application on the hard disk makes it a startup disk. Booting from a hard disk is much faster than booting from floppy diskettes.

Apple Hard Disks

The hard disks currently offered by Apple are all SCSI hard disks. This Hard Disk SC series includes hard disks that range in storage size from 20MB to 160MB. The replaceable hard disk module is the Hard Disk Assembly (HDA), which comes in two sizes, 3.5 inches and 5.25 inches.

All of the Hard Disk SCs can be used with the Apple IIe and Apple IIGS computers, that are equipped with an Apple II SCSI Card.

The Hard Disk SCs can be installed as internal hard disks in Macintosh computers. but not in Apple II computers.

HDA replacement modules come in the internal configuration which means they have built-in terminating resistor packs that serve as SCSI terminators. They also come with a factory-set SCSI priority number of zero. If you need to reconfigure an internal HDA for external use with an Apple II computer, you may need to change the priority number and remove the internal terminating resistors.

Handling and Positioning Hard Disks

You must handle hard disks with care because they have mechanical parts. Rough handling can cause a malfunction or damage the information on the disk.

To allow for proper ventilation, you must position the Hard Disk SCs flat. Do not place them to the left of an Apple computer because of the risk of magnetic interference from the computer's power supply and video circuitry.

Module Summary

External Hard Disk SC with an Apple IIGS

Setting up a Hard Disk SC with an Apple IIGS involves these basic steps:

1. Install an Apple II SCSI Card in the computer.
2. Make certain that the SCSI priority number on each hard disk is unique.
3. Connect a SCSI System Cable to the hard disk and to the computer.
4. Add a terminator to the hard disk (only if needed).
5. Partition the hard disk if it has more than 32MB of storage space.
6. Initialize the hard disk or the partitions of the hard disk.
7. If the hard disk is to be used as a startup disk, copy the required system software to the hard disk.

Powering On a Hard Disk

Always turn on the hard disk before the computer. Allow the hard disk at least 10 seconds to get up to speed.

Powering Off a Hard Disk

Hard disks use little power, so you can leave them on when unused. If you plan to leave the disk unused for a week or more, you can turn it it off.

Always switch off the computer before switching off the hard disk. Never switch off the hard disk while its LED is blinking.

Initialization

Initializing or formatting a hard disk:

- Completely erases any data on the disk
- Formats the hard disk to store data
- Runs a test to verify that the disk is OK

"Interleave ratio" refers to the ratio of consecutive sectors a computer can read and write to. Because different computers use different interleave ratios, you need to format a hard disk with the computer the hard disk will be used with.

Module Summary

Partitioning a Disk

Partitioning divides a hard disk into storage areas. Using the Advanced Disk Utility program, you can make a total of seven partitions on the disks connected to one SCSI card.

The two primary reasons for partitioning a disk are:

1) You can initialize each partition for a different file system.

2) On disks larger than 32MB, you must partition to use all of the storage space.

Before creating the partitions, you should plan them carefully. Once you have created them, you cannot change them without repeating the entire partitioning process, which erases everything on the disk.

Erasing a Disk

If you plan to use a disk again with the same file system but want to remove all the files, you can erase the disk. Erasing actually removes only the directory from the disk, but without the directory, the files are inaccessible (except by advanced data manipulation).

Zeroing a Disk

If you want to completely destroy all the data on a disk, you should zero it. Zeroing removes the directory and the files from the disk, so it takes longer than erasing. But zeroing ensures that nothing can be recovered from the disk. After zeroing a disk, it must be initialized again before being used.

Setting Up Multiple Hard Disks

To connect more than one external hard disk to an Apple computer, connect the second hard disk to the first with an SCSI peripheral interface cable. Likewise, connect a third hard disk to the second, and the fourth hard disk to the third.

You have completed this module.

Check your skills and knowledge against the Skills Checklist for this module. When you are ready, take the Module Test.

Module Test

Directions

Answer each item as directed.

1. Which of the following Hard Disk SCs can be installed in each of the Apple II computers? Indicate your answers by checking the appropriate spaces.

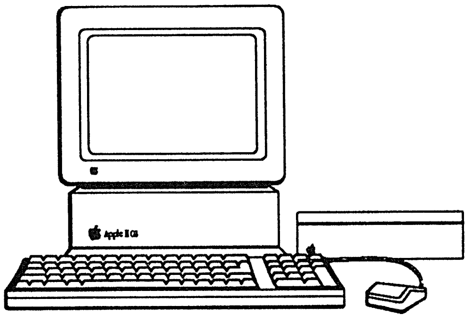
	HD20SC	HD40SC	HD80SC	HD160SC
Apple IIc Plus	____	____	____	____
Apple IIe	____	____	____	____
Apple IIGS	____	____	____	____

2. Which of the following Hard Disk SCs can be connected externally to each of the Apple II computers? Indicate your answers by checking the appropriate spaces.

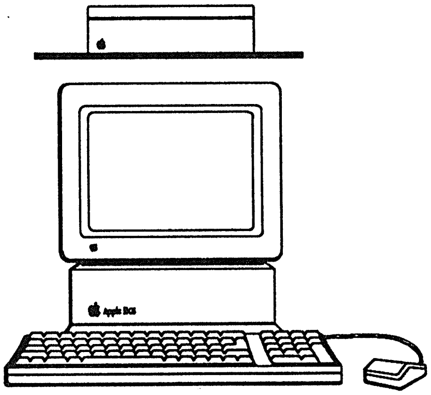
	HD20SC	HD40SC	HD80SC	HD160SC
Apple IIc Plus	____	____	____	____
Apple IIe	____	____	____	____
Apple IIGS	____	____	____	____

Module Test

3. Which of the following are acceptable arrangements for an Apple computer and an external Hard Disk SC? Circle all correct answers.



A



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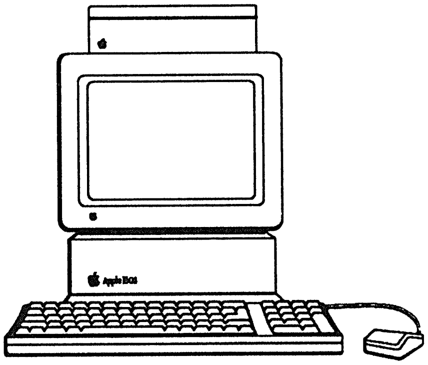

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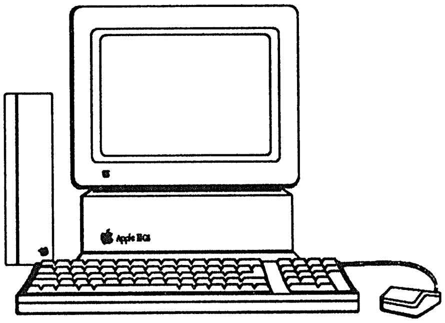
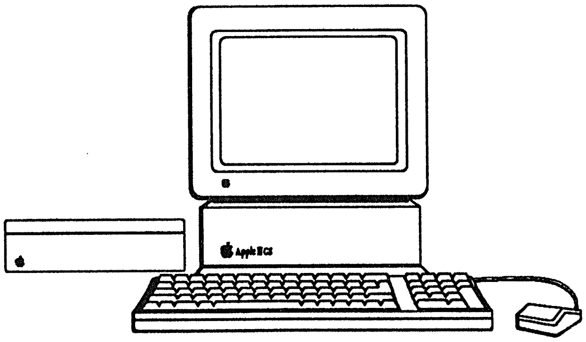


D



E

Module Test

4. Which slot on an Apple IIe or Apple IIGS can you **not** use for an Apple II SCSI Card? Check the correct answer.

____ A. slot 1

____ B. slot 2

__✓__ C. slot 3

____ D. slot 4

____ E. slot 5

5. Assume that you have just installed an Apple II SCSI Card in an Apple IIGS. What should you do next? Check the best answer.

____ A. Check the jumper on the card.

____ B. Partition the Hard Disk SC.

__✓__ C. Initialize the Hard Disk SC

____ D. Activate the slot.

6. How should you power up a system with an external Hard Disk SC? Check the recommended power-up procedure.

___ A. Turn the computer and the hard disk on simultaneously.

___ B. Turn on the computer, and then immediately turn on the hard disk.

___ C. Turn on the hard disk, and then immediately turn on the computer.

___ D. Turn the computer on first, wait until it warms up, and then turn on the hard disk.

_✓_ E. Turn the hard disk on first, wait until it warms up, and then turn on the computer.

Module Test

7. After you connect a new Hard Disk SC to an Apple IIGS computer, what do you have to do to enable the computer to communicate with the hard disk? Check the best answer.

   ___ A. Name the hard disk.

   ___ B. Install the appropriate update file(s).

   ___ C. Select the appropriate interleave ratio on the Control Panel.

   ___ D. Designate the hard disk as startup device on the Control Panel.

   ___ E. Install the System File and Finder application.

8. What is the primary difference between a hard disk that is a startup disk and a hard disk that is not a startup disk? Check the best answer.

   ___ A. The startup hard disk is initialized with a special format.

   ___ B. The startup hard disk must be installed inside the computer.

   ___ C. The startup hard disk contains the System files required to startup the system.

   ___ D. The startup hard disk is formatted with a 1:1 interleave ratio.

   ___ E. The startup hard disk must be connected directly to the computer.

Module Test

9. How do Apple internal hard disks differ from Apple external hard disks—as shipped from the factory? Check all correct answers.

___ A. Internal hard disks have built-in resistor packs (terminators), and external disks do not.

___ B. External hard disks have built-in resistor packs (terminators), and internal disks do not.

___ C. Internal hard disks have 3.5-inch drives, and external hard disks can have either 3.5-inch or 5.25-inch drives.

___ D. External hard disks are SCSI devices, and internal hard disks are not SCSI devices.

___ E. Internal hard disks are initialized in the factory; external hard disks must be initialized by users (or service technicians).

___ F. Their factory-set SCSI priority numbers are different.

10. If an Apple IIGS system has more than one hard disk containing startup information, what do you use to designate the preferred startup disk? Check the correct answer.

___ A. The Installer

___ B. The Advanced Disk Utility

___ C. The Control Panel

___ D. The SCSI Hard Disk update file

Module Test

11. What does it mean when the Hard Disk SC LED is blinking on and off? Check all correct answers.

    ___ A. The hard disk has speeded up and is ready to be used.

    ___ B. The hard disk is reading or writing data.

    ___ C. The hard disk is in a "power saving" mode.

    ___ D. The hard disk is malfunctioning.

12. Which of the following statements apply to zeroing a disk? Check all correct answers.

    ___ A. It removes the directory from the hard disk.

    ___ B. It removes all data from the hard disk.

    ___ C. It removes the file system from the hard disk.

    ___ D. It is appropriate if you plan to use the disk again with the same file system.

    ___ E. It is the appropriate if you want to make certain that no one will ever be able to access the data that is on the disk.

    ___ F. Afterwards, the hard disk must be initialized again before it can receive data.

Module Test

13. Which of the following statements apply to erasing a disk? Check all correct answers.

    ___ A. It removes the directory from the hard disk.

    ___ B. It removes all data from the hard disk.

    ___ C. It removes the file system from the hard disk.

    ___ [✓ D.] It is appropriate if you plan to use the disk again with the same file system.

    ___ E. It is the appropriate if you want to make certain that no one will ever be able to access the data that is on the disk.

    ___ F. Afterwards, the hard disk must be initialized again before it can receive data.

14. Why would you want to partition a hard disk for use with an Apple IIGS (to be used with ProDOS)? Check all correct answers.

    ___ A. You can erase data on a partition without erasing the entire hard disk.

    ___ [✓ B.] If a disk is larger than 32MB, partitioning allows you to use all of the storage space on the disk.

    ___ C. Each partition can have a different file system.

    ___ D. You can change the file system of a partition without reinitializing the entire hard disk.

    ___ E. You can create one partition to start out with and then add other partitions as your data needs increase.

Module Test

15. If you are connecting two external Hard Disk SCs, what do you connect the second hard disk to? Write your answer in the space provided.

16. A customer has a hard disk that he previously used with a Macintosh IIcx, but now he wants to use the hard disk with an Apple IIGS. After the customer connects the hard disk to the Apple IIGS, what does he have to do to the hard disk so that the Apple IIGS can use it? Why does he have to do it? Write your answer in the space provided.

Compare your answers to those on the following pages.

Module Test (Answers)

1. The Hard Disks cannot be installed in any of the Apple II computers. You should not have checked any of the spaces for this item.

2.

	HD20SC	HD40SC	HD80SC	HD160SC
Apple IIc Plus				
Apple IIe	X	X	X	X
Apple IIGS	X	X	X	X

3. A, B
4. C
5. D
6. E
7. B
8. C
9. A and F
10. C
11. B
12. A, B, C, E, F
13. A and D
14. B and C

15. Connect the second hard disk to the open SCSI port on the first hard disk.

16. The customer has to install the appropriate update on the startup disk and reinitialize the hard disk. He has to reformat it because the Apple IIGS requires a different format.

Reminder: *This written test does not verify that you can perform the hands-on tasks covered in this module. Be sure you can perform all of the tasks listed on the Skills Checklist.*

Before continuing with the next module, refer to the evaluation booklet and complete the evaluation for this module.